

On the authorship and primary type of *Cerion incanum* (Gastropoda: Cerionidae)

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ABSTRACT

Although the author of the species *Cerion incanum* (originally proposed as *Pupa incana*) has been cited as Binney, 1851, a review of his multiple uses of the name do not satisfy the criteria of availability set forth by the International Code of Zoological Nomenclature (Article 12), until the publication of illustrations of three shells labelled *Pupa incana* in 1857. In a separately authored paper published as part of Binney's multi-volume work on the Terrestrial Mollusks of the United States, Leidy published detailed descriptions and illustrations of several organ systems of *Pupa incana* in 1851. Thus, the authorship of *Pupa incana* must be attributed to Leidy, 1851, rather than to Binney. As Leidy did not retain the dissected tissues, there is no surviving type material for *Pupa incana* Leidy. A neotype is designated for *Pupa incana* Leidy, 1851, from the subsequently designated type locality in order to provide an objective standard of reference for this species-group taxon that may be used to evaluate the relationship of the nominotypical subspecies to three subsequently described subspecies, as well as to two introduced Bahamian species with which it is documented to have hybridized.

Additional Keywords: *Pupa incana*, authorship, neotype, Florida Keys

INTRODUCTION

The family Cerionidae is well known for its remarkable morphological diversity and large number of taxa, particularly in the recent faunas of Cuba and the Bahamas. In contrast, this family is represented in the Florida Keys by a single native species. The authorship of this species, *Cerion incanum* (originally proposed as *Pupa incana*), has universally been attributed to Binney, 1851 (e.g., Maynard, 1889; Pilsbry, 1902; Bartsch, 1920; Abbott, 1989), despite recognition by several subsequent authors of difficulties with the manner in which it was published (e.g., W. G. Binney, 1859: 142; Clench, 1957: 148; Pilsbry, 1946: 162).

A review of Amos Binney's posthumously published work (Binney, 1851–57) in the context of the requirements of the International Code of Zoological Nomenclature (ICZN, 1999) reveals that his uses of the name *Pupa incana* do not occur in a way that satisfies the criteria of availability (Article 12) until the publication of plate 68 (Binney, 1857), which associates images of two adult and one juvenile shell with the name *Pupa incana* (Article 12.2.7, ICZN, 1999: 17). The first usage of the name *Pupa incana* in conjunction with a description and illustrations was in a portion of the work written by Joseph Leidy (Leidy, 1851) reporting on the anatomy of several terrestrial gastropods. Thus, the authorship of this species must be attributed to Leidy, 1851. Leidy's description pre-dates the publication of *Pupa detrita* Pfeiffer, 1854, which is a junior synonym of *Pupa incana* Leidy, 1851, but a senior synonym of *Pupa incana* Binney, 1857.

HISTORICAL REVIEW

Amos Binney, M.D. (1803–1847), a physician, businessman, and naturalist had an avid interest in the terrestrial Mollusca of North America, accumulated a sizeable collection, and had undertaken the production of a major publication on the subject. Despite his untimely death (February 18, 1847), he had made provisions for the completion and publication of this work in his will. Augustus A. Gould was engaged by the executors of Binney's estate to edit and publish this work. Gould (in Binney, 1851a: ix–x) reported that "The work was found to be less complete than anticipated ..." and acknowledged that there are some discrepancies between the first volume and the second, portions of which were written by Gould (clearly identified by 'annexation of the letter "G."')

The work, titled *The Terrestrial Air-Breathing Mollusks of the United States, and the Adjacent Territories of North America*, was published in five volumes, the first three attributed to A. Binney (1851–1857) although

edited by A. A. Gould. The first volume (1851) contains a series of essays by Amos Binney on topics ranging from the history of zoological investigations in America to the zoogeography and ecology of terrestrial Mollusca, and also includes a section, authored by Joseph Leidy, on the anatomy of the terrestrial gastropods of the United States. The systematic treatment of taxa begins in the second volume (1851) and continues into the third volume (1857), which also contains the plates illustrating the treated species. The fourth and fifth volumes were authored by W. G. Binney (1859–1878), the son of Amos Binney, and are a continuation and expansion of the first three volumes. W. G. Binney further continued his work on this fauna, publishing three supplements to the fifth volume (Binney, 1883; 1886; 1890).

Chronological appearance of the name *Pupa incana* in *The Terrestrial Air-Breathing Mollusks of the United States, and the Adjacent Territories of North America*

VOLUME 1

Pupa incana Binney, 1851a: 109 (*nomen nudum*). The name appears in a "Table of Distribution of Species in Several Geographic Regions," listing *Pupa incana* as one of the "Species noticed in the Atlantic Region Only".

Pupa incana Binney, 1851a: 119 (*nomen nudum*). *Pupa incana* is listed as among the land mollusks that are indigenous to Cuba but also occur in southern Florida.

Pupa incana Binney, 1851a: 128 (*nomen nudum*). *Pupa incana* is listed in a table as one of the species in "Section 1." Identified on page 108 as occurring on "The Peninsula of Florida". The species name is not italicized in the table, indicating that it is not "introduced from foreign countries" (see p. 126).

Pupa incana Binney, 1851a: 153 (*nomen nudum*). *Pupa incana* is listed as one of the species "undoubtedly from Cuba", transported on floating debris, that has flourished in southern Florida.

Pupa incana Binney, 1851a: 162 (*nomen nudum*). *Pupa incana* is listed in a "Table of Distribution of Species Inhabiting the United States, in other parts of America" indicating that it also occurs in Cuba.

Pupa incana Leidy, 1851: 199 (*nomen nudum*). *Pupa incana* appears in a list of animals dissected.

Pupa incana Leidy, 1851: 216 (*nomen nudum*). The name appears ("In *Vaginulus*, *Pupa incana*, etc.") in a description of the "tissues of the digestive apparatus". This is a generalized description that does not distinguish *Pupa incana* from *Vaginulus*.

Pupa incana Leidy, 1851: 230–231. A detailed description of the genital apparatus of *Pupa incana* is pro-

vided. This is the first association of the name *Pupa incana* with a description (of the reproductive system) that meets the requirements of Article 12.1 (ICZN, 1999:16), making the name *Pupa incana* available as *Pupa incana* Leidy, 1851.

Pupa incana Leidy, 1851:259. *Pupa incana* appears in captions to figures ii–iv of plate 15, as well as on the plate itself. This plate includes three illustrations of the dissected soft tissues (Article 12.2.7; ICZN, 1999:17), making the name *Pupa incana* available.

VOLUME 2

Gould in Binney, 1851b: 314. Uses the binomen *Pupa incana* in a discussion of supraspecific relationships within *Pupa*. The annotation "[G.]" identifies this as the work of Gould.

Gould in Binney, 1851b:316–319. This description was no doubt intended by Binney to be the formal description of *Pupa incana*. However, Gould replaced the name with *Pupa maritima* Pfeiffer. The following parenthetical note, identified as being by Gould [-G.] follows the description.

[This shell was described by Dr. Binney as a new species, and is referred to in the first volume under the name, *P. incana*; and the plate representing it is so lettered; but it is so evidently the *P. maritima* of Dr. Pfeiffer that it would be deviating from scientific rules to introduce it under any other name. It is most likely that *P. cyclostoma*, Küster, is merely a small specimen of this species, its variation in size being very considerable. -G.]

VOLUME 3

Gould in Binney, 1857: 39. "Index to Plates" says "*Pupa maritima* Pfeiffer" with a note that the plate itself is lettered *Pupa incana*.

Binney, 1857: pl. 68. Plate illustrating two adult and one juvenile specimen is labeled *Pupa incana*. This makes the taxon *Pupa incana* Binney available (Article 12.2.7; ICZN, 1999:17) as of 1857.

VOLUME 4

Binney, W.G., 1859: 142. W. G. Binney commented "In 1851, this species was only designated by name in vol. i; the full description was given in vol. ii, the name being changed by Gould to *P. maritima*. Shuttleworth's description of *detrita* has not priority over the name I have retained [*P. incana*]."

Binney, W.G., 1859: 206, pl. 79, fig. 17. The sub-species *Pupa incana fasciata* is introduced in the "Explanation of the Plates" for a variety from Key Biscayne, Florida.

VOLUME 5

Binney, W.G. 1878: 213. Included the note "*Pupa incana*, = *Strophia*"

Binney, W.G. 1878: 220–222, figs. 125, 126. A synonymy and description of the shell, jaw and anatomy of *Strophia incana* is provided.

TYPE MATERIAL

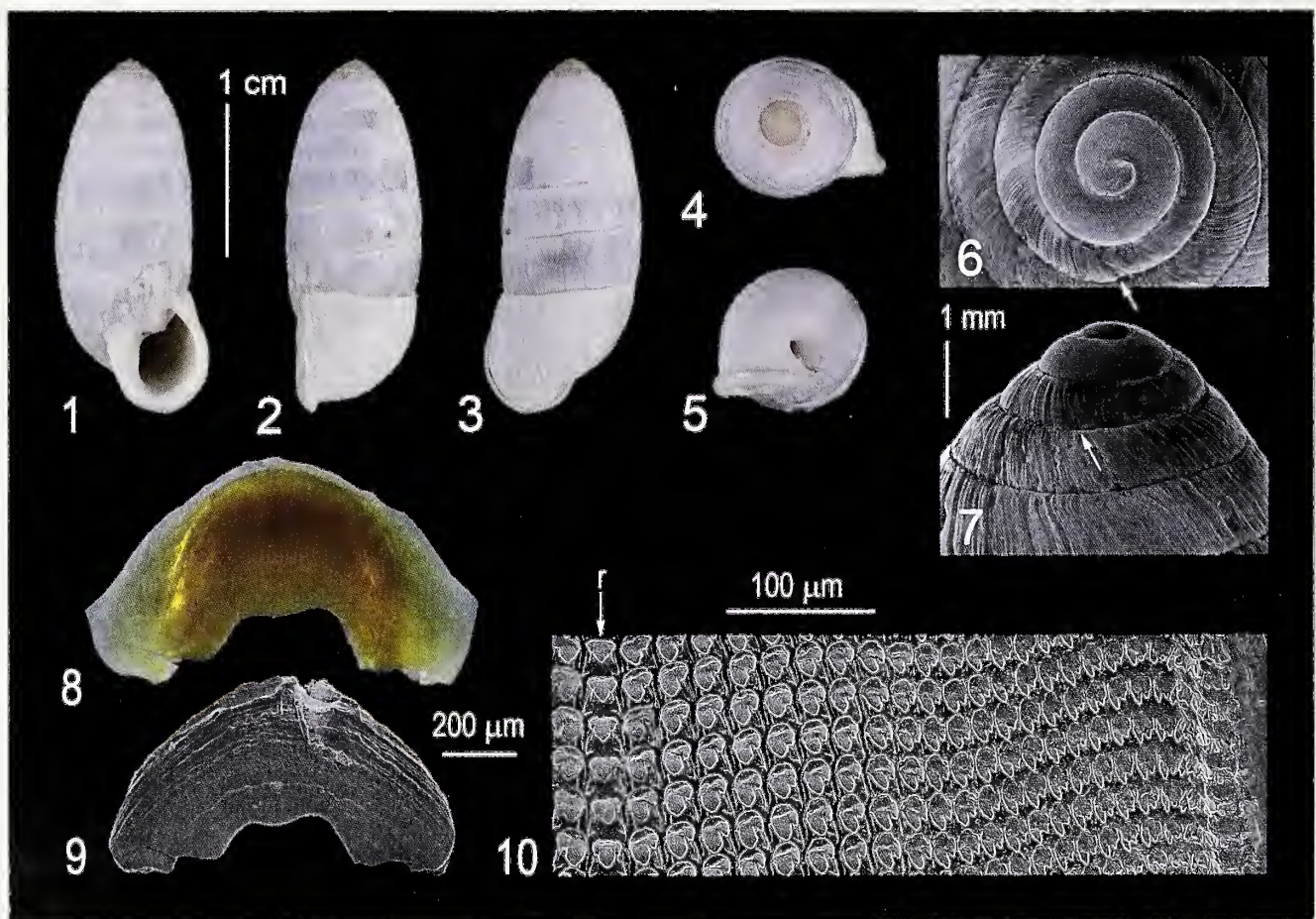
It is not clear if Leidy's descriptions of several organ systems of *Pupa incana* were based on one or multiple dissected specimens. It is probable that the shell(s) were crushed in order to access the soft tissues, and the anatomical material was not saved following dissection. Thus, there is no surviving type material for Leidy's taxon.

Gratacap (1901) reported that the Binney and Bland collection of North American land shells, which included specimens used by Amos Binney and A. A. Gould in the preparation of *Terrestrial Air-Breathing Mollusks of the United States*, as well as specimens that W. G. Binney incorporated from his collection and from the cabinet of Thomas Bland, came to the American Museum of Natural History in 1882. In the published catalog of this

collection, Gratacap (1901: 369) listed ten lots of *Strophia incana* [= *Cerion incanum* = *Pupa incana*], from Florida, Key Biscayne, and Key West. Among these, he refers to two lots [Cat. Nos. 795, 796] as "Type", citing the pagination for the description "(as *maritima* Pfeiff.)" and referencing the plate published in 1857, illustrating two adult specimens and a juvenile over the name *Pupa incana*. A specimen in the collections of the Museum of Comparative Zoology (MCZ 149431) is also catalogued as a syntype of *Pupa incana* Binney, 1851.

However, these specimens were not seen by Leidy. As neither the description (as *maritima*) nor the illustrations of these shells were published until after Leidy's anatomical descriptions, they cannot be considered as part of a syntype series of *Pupa incana* Leidy, 1851 (Article 73.2.1, ICZN, 1999: 81). Thus, there are no name-bearing type specimens of *Pupa incana* Leidy, 1851.

Early authors regarded the geographic range of *Cerion incanum* to span Cuba, the Bahamas, and southern Florida, both the mainland and the Keys. Pilsbry (1902:



Figures 1–10. *Pupa incana* Leidy, 1851. Neotype, USNM 1231355. Little Hamaca City Park, Government Road, Key West, Florida, 24°33.410' N, 81°46.370' W. In roadside leaf litter, under rock, at base of grass clumps. February 8, 2013. M.G. Harasewych coll. 1–5. Shell. 1. Apertural, 2. Lateral, 3. Dorsal, 4. Apical, and 5. Basal views. 6–7. Scanning electron micrographs of protoconch. 6. Apical, and 7. Lateral views. Arrows indicate protoconch/teleoconch transition. 8–9. Dorsal views of jaw. 8. Photomicrograph. 9. Scanning electron micrograph. 10. Scanning electron micrograph of portion of radular ribbon. Entire radula consists of 135 rows, each row with formula 24-1-24. r, rachidian tooth.

214) restricted the type locality of *Cerion incanum* to the area around the salt ponds on Key West. Subsequent workers further subdivided this species into subspecies. W.G. Binney (1859) proposed the variety *Pupa incana fasciata* for a form from Key Biscayne, Florida. Pilsbry and Vanatta (1899) added *Cerion incanum saccharimeta* from Sugarloaf Key, and Pilsbry (1902) described *Cerion incanum vaccinum* from Key Vaca.

A **neotype** for *Pupa incana* Leidy, 1851, is designated from a population [Little Hamaca City Park, Government Road, Key West, Florida, 24°33.410' N, 81°46.370' W] inhabiting the edges of salt ponds in Key West, Florida that corresponds to the type locality reported by Pilsbry. This neotype (USNM 1231355) consists of 2.0 protoconch whorls and 8.5 teleoconch whorls (Figures 1–7), has a shell length of 24.18 mm, a shell width of 9.47 mm, and a maximum aperture length of 6.64 mm. It corresponds to the *Cerion incanum incanum* of authors, and generally conforms to Leidy's anatomical descriptions (although Pilsbry 1946: 162, noted some inaccuracies in Leidy's description of the pallial organs) as well as to the numerous detailed subsequent descriptions of the anatomy and shell morphology (e.g. W. G. Binney, 1878: 220; Bartsch, 1920: 7; Pilsbry, 1902: 213; 1946: 160–165).

A neotype is necessary in order to provide an objective standard of reference for this species group taxon that may then be used to evaluate the relationships of the nominotypical subspecies to three subsequently described subspecies that are native to Florida. A precisely defined concept of *Cerion incanum incanum* is of particular importance in unravelling the relationships of this species to several species that have been purposely introduced into the Florida Keys from the Bahamas and elsewhere during the early 20th century (see Bartsch, 1920; Pilsbry, 1946; Harasewych and Strauss, 2006), as some of these have been documented as having hybridized with *Cerion incanum* (Woodruff and Gould, 1987).

In addition to the shell, radula, and jaw, genomic DNA samples have been archived for this neotype. Results of Next Generation sequencing of a subsample of this DNA, including the reconstruction of a complete mitochondrial genome and the complete ribosomal operon, will be published separately.

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